

## Research Article

### EXPLORING HINDU INDIAN EMOTION EXPRESSIONS: Evidence for Accurate Recognition by Americans and Indians

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**Abstract**—Subjects were presented with videotaped expressions of 10 classic Hindu emotions. The 10 emotions were (in rough translation from Sanskrit) anger, disgust, fear, heroism, humor-amusement, love, peace, sadness, shame-embarrassment, and wonder. These emotions (except for shame) and their portrayal were described about 2,000 years ago in the *Natyasastra*, and are enacted in the contemporary Hindu classical dance. The expressions are dynamic and include both the face and the body, especially the hands. Three different expressive versions of each emotion were presented, along with 15 neutral expressions. American and Indian college students responded to each of these 45 expressions using either a fixed-response format (10 emotion names and “neutral/no emotion”) or a totally free response format. Participants from both countries were quite accurate in identifying emotions correctly using both fixed-choice (65% correct, expected value of 9%) and free-response (61% correct, expected value close to zero) methods.

An enduring question in the study of emotion is whether the appraisal, experiential, physiological, and facial components are universal or vary significantly across cultures. Over the past several years, emotion recognition studies have suggested that anger, disgust, fear, happiness, sadness, and surprise are universally recognized (e.g., Ekman, 1972; Ekman & Friesen, 1971; Ekman et al., 1987; Haidt & Keltner, 1999; Izard, 1971, 1977).

The existing literature on emotion recognition has focused mainly on

- The face. Very little attention has been paid to bodily or hand movements.
- Static photographs. Studies showing that certain emotions, like contempt (Ekman & Friesen, 1986), shame (Keltner, 1995), and sympathy (Eisenberg et al., 1989), could be recognized better in dynamic portrayals, including head and eye deviations, than with photographs of faces raise the possibility that other emotions may be better recognized if mobile. Prototypical affective displays are rare in real life and probably seen only when emotion is extremely intense (Campos, 1994). It is possible that some emotions (e.g., love, amusement) are inherently dynamic and lack a distinctive frozen expression and that by using dynamic stimuli the study of emotion recognition could be expanded.
- English-language emotion terms. In lists generated by North American researchers, emotions are represented by single words in the English language. Other languages may either lack one of these words, fail to distinguish between two of them, or lexicalize emo-

tions that have no translation in English (Heider, 1991; Russell, 1991).

- A fixed-choice recognition methodology. This methodology usually limits choices to single emotion words, and prevents free expression of emotional responses by participants (Russell, 1994; Russell & Barrett, 1999; Russell, Suzuki, & Ishida, 1993). Studies that allowed participants to pick their own emotion words (free-response method; e.g., Boucher & Carlson, 1980; Izard, 1971; Rosenberg & Ekman, 1995) generally reported lower (though still greater than chance) rates of “correct” labeling.

#### HINDU INDIAN THEORY OF EMOTION AND EXPRESSION

The *Natyasastra* by Bharata (1956), which dates from the 1st to 2nd century A.D., is probably the oldest surviving treatise on the performing arts in the world and details a theory of emotion that can be compared with Western theories (Hejmadi, 1999; Shweder, 1993). The *Natyasastra* mentions a list of nine primary emotions and provides a highly detailed account of how each emotion is to be expressed (see Hejmadi, 1999, for more detail).

The Hindu-Indian system provides a large number of potentially basic emotions, although it is not clear that all *Natyasastra* emotions would fit all Western definitions of emotions. In this study, we assessed the recognition of a list of 10 emotions. Of the 10 emotions studied, 9 were from the original Indian list. A 10th, *lajya*, was added because it is expressed in India, is portrayed in the classical dance, and has been the subject of some attention in the emotion and cultural psychology literature (Menon & Shweder, 1994; Shweder, 1993). *Lajya* is seen as a positive emotion in India, though its nearest translations (embarrassment, shame, shyness) could be considered as negative in the West.

Western taxonomies of emotion are more similar to the *Natyasastra* taxonomy for negative than for positive emotions. For example, both Western and *Natyasastra* lists include anger, fear, sadness, and disgust. However, on the positive side, Western happiness and perhaps surprise do not correspond well with the *Natyasastra*'s amusement, love, heroism, and perhaps peace and wonder.

The *Natyasastra* spells out highly sophisticated descriptions of how each emotion is to be expressed. Particular attention is paid to the face and hands. Typically, a young initiate of Indian classical dance undergoes rigorous training to learn the intricacies of portraying emotional expressions. Schechner (1988) considered posed expressions of the *Natyasastra* emotions to be comparable to Ekman's (1972) photographs.

Some studies have focused on nonfacial emotion cues. Meijer (1989) found relationships between whole body movements and specific emotions. Wallbott and Scherer (1988) found cross-cultural agreement in self-report on certain emotion movement patterns. Other studies have also revealed relationships between particular body

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movements and specific emotions (e.g., Clynes, 1975; Kudoh & Matsumoto, 1985; Nakamura, Buck, & Kenney, 1990; Scherer, Wallbott, Matsumoto, & Kudoh, 1986; Sogon & Masutani, 1989; see also Ekman, 1977). What distinguishes the present study from its predecessors is that, first, the movements portrayed were ancient systematic treatments and, second, the most prominent aspect of nonfacial expression was hand gesture. The stimuli used for this study are not familiar to most Americans. Even among Indians, only those who learn classical dance formally learn these representations.

In this study, we compared American and Indian recognition of the emotional portrayals in the *Natyasastra*. This first study of recognition of emotions as designated in the *Natyasastra* and the classical Indian dance addressed some fundamental issues in the comparative study of emotion. It assessed the role of dynamic expressions and of expressions that include both the face and the body, including hands and head orientation; also, the study employed a wide range of emotions and unconstrained free-response as well as fixed-choice methodology.

## METHOD

### Participants

Participants from the United States were 48 undergraduate students in the Introduction to Psychology class at the University of Wisconsin (22 males and 26 females). They ranged in age from 18 to 25.

Participants from India were 47 Hindu Indians (24 males and 23 females) living in Bhubaneswar in the eastern Indian state of Orissa. They ranged in age from 18 to 40. The Indian subjects were recruited through a network of acquaintances and included representatives from each of the four major castes; they were drawn from the old and new parts in the city of Bhubaneswar. All were literate, and half were college educated. The Indian and U.S. participants were assigned randomly to either the fixed-response or free-response group.

### Materials

The stimuli were videotaped portrayals of 45 expressions (30 of emotions and 15 neutral expressions). The portrayals were in accordance with the instructions and descriptions in the classic Indian texts used in contemporary classical dance: *Natyasastra* (Bharata, 1956; 1st–2nd century A.D.), *Abhinaya Darpana* (Nandikeswara, 1987; 10th century A.D.), and *Abhinaya Prakasika* (Gopinath, 1957). For each emotion, we selected three of the approximately eight portrayals designated in the texts. The portrayals selected were those described in a consistent manner across the three texts, and thus were among those more likely to have survived across the centuries to modern times. The final choice of emotion stimuli to be used was made jointly by two of the authors (Hejmadi and Davidson), one American graduate student, and two Indian gurus (professors of dance at the State Music College in Orissa).

Subjects saw three portrayals of each of 10 emotions, plus 15 neutral displays, presented in a randomized order. There were three versions of the same set of portrayals, varying only in the particular random order of presentation. The neutral gestures were chosen from other portrayals in Indian texts, and were selected using the criterion that they had little obvious meaning and minimal similarity to the displays of the 10 target emotions

One of the authors, Hejmadi, performed all the portrayals on the stimulus tapes. Hejmadi has 20 years of experience in dance and is a certified professional. Two experienced dance gurus in India validated that the portrayals were true to the exact specifications in the Indian texts before the study began.

Two videotaped portrayals of *Natyasastra* emotions (love and anger) that were not employed in the study proper were presented before the actual testing began, to familiarize participants with the technique. Participants were asked to make the same judgments for these as for the test portrayals.

The portrayals on the tapes included a minimum of distractions. The dancer wore a plain dark top with only hands and arms exposed, and the background was uniformly dark. The videotapes were viewed on a 25-in. screen. No sound accompanied the dance. The time taken for all 45 portrayals (4–10 s each), the subjects' responses, and debriefing was approximately 90 min.

Subjects in the fixed-response group selected from a list of 10 emotions and "neutral/no emotion" the emotion term that best matched each portrayal. The emotions were in alphabetical order except that the "neutral/no emotion" choice was presented last. The 10 choices for emotion words were "anger," "disgust," "fear," "heroism/valor," "humor/amusement," "love," "peace," "sadness," "shame/embarrassment/shyness," and "wonder." For the Indian participants, the fixed responses were Oriya translations of the emotion words. The original words used for the emotions in the Indian texts were in Sanskrit. The Sanskrit words were translated into Oriya and English for the Indian and American participants, respectively. (Translators were Hejmadi, two Indian professors, and two graduate students from India who were fluent in Sanskrit, English, and Oriya.)<sup>1</sup>

Subjects in the free-response group were asked, "What emotion, if any, do you see in the gesture just shown? Please write down the word/words that you think are appropriate."

### Procedure

Participants were run in small groups of 3 to 5 in a quiet room. Subjects were given up to 15 s to make a response to each portrayal.

## RESULTS

### Fixed-Response Format

The results are tabulated in Table 1. In the fixed-response format, subjects chose among 11 options (10 emotions and "neutral/no emotion") for each of the 30 emotion displays and 15 neutral displays. In this analysis, we consider only the responses to the 30 emotion displays. The probability of guessing the correct emotion on any trial was 1/11; hence, the predicted total correct score would be 2.73 (30/11). Performance of subjects from both countries was extremely good, averaging 65% correct, and was far above the chance level of 9%.

For Americans, in 27.5 of the 30 cases, the predicted emotion received the highest number of responses. (Ties between the correct

1. In cases in which one word was not found sufficient, more than one word was used.

**Table 1.** Results from U.S. and Indian participants for the three versions of each emotion

Emotion	Fixed response <sup>a</sup>				Free response			
	U.S. participants		Indian participants		U.S. participants		Indian participants	
	<i>n</i> giving correct response <sup>b</sup>	Most common incorrect response <sup>c</sup>	<i>n</i> giving correct response <sup>b</sup>	Most common incorrect response <sup>c</sup>	<i>n</i> giving correct response <sup>b</sup>	Most common incorrect response <sup>c</sup>	<i>n</i> giving correct response <sup>b</sup>	Most common incorrect response <sup>c</sup>
Anger 1	17	disgust ( <i>n</i> = 8)	16	heroism ( <i>n</i> = 5)	18		17	
Anger 2	13	disgust ( <i>n</i> = 8)	21		10		16	
Anger 3	20		20		16		20	
Disgust 1	24		15		19		16	
Disgust 2	15	<i>lajya</i> ( <i>n</i> = 10)	13		15	fear ( <i>n</i> = 5)	13	anger ( <i>n</i> = 4)
Disgust 3	23		12		17		17	
Fear 1	20		22		16		20	
Fear 2	14		16		15		20	
Fear 3	16		14	wonder ( <i>n</i> = 5)	14		16	
Heroism 1	12	neutral ( <i>n</i> = 5)	14	anger ( <i>n</i> = 5)	7	anger ( <i>n</i> = 6)	16	neutral ( <i>n</i> = 5)
Heroism 2	20		18		10	anger ( <i>n</i> = 4)	19	
Heroism 3	17		16		9		16	
Humor 1	20		17		14		15	
Humor 2	25		22		20		20	
Humor 3	18		15	neutral ( <i>n</i> = 4)	13		18	
Love 1	23		18		13		17	
Love 2	12	humor ( <i>n</i> = 8)	14		16		14	
Love 3	21		15		16		15	humor ( <i>n</i> = 5)
Peace 1	21		14		14		18	neutral ( <i>n</i> = 4)
Peace 2	7	neutral ( <i>n</i> = 10)	16		8		18	neutral ( <i>n</i> = 4)
Peace 3	18		12	neutral ( <i>n</i> = 8)	14		20	
Sadness 1	17		14		13		17	
Sadness 2	17		13	neutral ( <i>n</i> = 4)	11		13	
Sadness 3	8	<i>lajya</i> ( <i>n</i> = 8)	18		6		17	
<i>Lajya</i> 1	9	peace ( <i>n</i> = 5)	17		10	love ( <i>n</i> = 6)	14	love ( <i>n</i> = 4)
<i>Lajya</i> 2	6	love ( <i>n</i> = 7)	15		5	love ( <i>n</i> = 4)	14	love ( <i>n</i> = 4)
<i>Lajya</i> 3	18		16		10	love ( <i>n</i> = 4)	17	
Wonder 1	21		21		16		20	
Wonder 2	20		18		8		17	
Wonder 3	21		19		6		21	

<sup>a</sup>Values of 6 or more are significant at *p* < .05 (binomial).

<sup>b</sup>Total *ns*: U.S. fixed response, *n* = 25; Indian fixed response, *n* = 23; U.S. free response, *n* = 23; Indian free response, *n* = 24.

<sup>c</sup>Results are shown only if the most common incorrect response was given by at least 4 participants.

choice and one other choice were scored as .5.) In 28 cases, the number of correct responses was significantly above chance (*p* < .01 or better). The mean number correct, 16.0, was far above the expected value of 2.73.

For Indians, in 30 of the 30 cases, the predicted emotion received the highest number of responses, and for all 30 emotion displays, the number of correct responses was significantly above chance (*p* < .01 or better). The mean number correct, 16.3, was far above the expected value of 2.73.

There were no significant differences in overall performance between Indian and American participants in the fixed-response condition.

In 15 cases, the most common incorrect response was given by more than 3 participants (Table 1). In 2 of these cases, the correct response was not the most frequent response, and in 1 case, there was a tie. Two of these 3 exceptions involved the emotion *lajya*, and all involved American subjects.

### Free-Response Format

For the free-response format, the data were even more impressive, with an overall score of 61% correct, compared with the extremely low probability of guessing a correct response (i.e., selecting, from among all the emotion words in the language, one of the few appropriate emotion words). We selected, a priori, a small number of words as appropriate responses for each emotion display (see the appendix). In Table 1, we report the number of subjects who offered any of the words from the correct category for each display, as well as the most frequent incorrect response (i.e., words from any other emotion category), if it was given by more than 3 participants. In 13 cases, more than 3 participants gave the same incorrect category response (Table 1). In all cases, though, the correct response was the most frequent one.

Surprisingly, a rather high number of subjects reported the targeted emotion words; the mean number correct for Americans was 12.1,

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with the predicted emotion highest in all 30 cases. For Indian subjects, the mean number correct was 17.0, with the predicted emotion the most frequent response in all 30 cases. In 24 of 30 cases ( $p < .001$ ), the percentage correct was higher for the Indians than for the Americans, and the mean number correct was marginally higher for the Indians than for the Americans,  $t(47) = 2.49, p < .05$ .

### Neutral Responses

"Neutral/no emotion" was the most common fixed response for each of the 15 neutral portrayals. On average, this response was given 48% of the time by Americans and 67% of the time by Indians. In free recall, 20% of American responses and 22% of Indian responses for these portrayals were "neutral" or "no emotion." The most common emotion listed for the neutral portrayals was "peace"; 5% of Americans and 3% of Indians selected this emotion in the fixed-response condition, and 4% of Americans and 1.5% of Indians listed it in the free-recall condition.

### DISCUSSION

The portrayals of the 10 Hindu emotions explored in their classical representation were recognized with a high degree of accuracy by both American and Indian subjects in both fixed-response and free-recall formats. This excellent performance extended to the positive emotions, which are not normally represented as basic, distinctively expressed emotions in most Western taxonomies. The existence of a characteristic, universal facial expression has been an important feature in designating "basic emotions." The results generally support Ekman's (1972) claim for universal recognition of the emotions of anger, disgust, fear, and sadness. The results also suggest that, on expressive criteria, there may be more positive basic emotions than have been previously recognized.

In the free-response format, Indians were more accurate than Americans for the three indigenous emotions, *lajya*, peace, and heroism. This result may be an indication of the greater salience of indigenous categories or their lexical referents for the appropriate (Indian) culture.

The present results raise many questions with respect to the expression of emotion and the taxonomy of emotions. Future research should address the content analysis of the stimuli, and the features, or feature combinations, that best characterize each emotion category. Unlike the traditionally used facial displays, these stimuli included bodily components. It should be possible in further studies to evaluate the relative contributions of bodily and facial signals. The results also encourage further search for a more differentiated set of "basic" positive emotions.

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## APPENDIX

The English free-report words (and Oriya words, in parentheses) that were scored as equivalent, or correct, were as follows:

Anger: accusing, aggression, anger, annoyed, assertive, attack, frustrated, frustration, fury, irritated, killing, mad, mean, rage, stern, vindictive, violent (birakta, birakti, biraktibhaba, mariba, raga, ragiba, ragijiba)

Disgust: contempt, disgust, dislike, gross, grossed out, repulsed, sickened, yuck (bitrushna, chhi- chi kariba, chi-chhakara, ghrna, tacchalya, thhu- thhu kariba, tuccha, tuccha kariba)

Fear: afraid, anxiety, anxious, fear, fearful, fright, frightened, horrified, scared, scary, spooked, tension, terror, terrorized, worried, worry (bhaya, chhania, dara, dariba, darijiba, rakhya kara, thariba)

Heroism: confidence, confident, kinglike, pride, proud, righteous, royal, success, triumphant, valiant, valor, valorous, vanity, vanquish, victorious, victory, winner, winning (bijaya kariba, bijayi, jaya kariba, jayajukta, jitayiba, raja pari, vira, vira pari)

Humor: amused, chuckle, clowning around, funny, goofy, happy, humor, joy, laughter, smiling, teasing (hasa, hasa lagiba, hasamadiba khusi, hasiba, khusi lagiba)

Love: affection, caress, caressing, caring, caring for, cherish, compassion, coy, flirt, flirtatious, flirting, hugging, love, love me, loved, loving, lustful, making eyes at, seduction, seductive, warmth (allingana kariba, batchalya, bhala paiba, gela kariba, mamata, prema, sneha)

Peace: calm, contemplate, peace, peaceful, pensive, relaxing, serene, serenity, spiritual, think, thinking, thoughtful (dhyana, dhyana kariba, japa kariba, japiba, santa, santa heba)

Sad: alone, disappointed, disappointment, give up, give up hope, helplessness, lonely, sad (chinta, chinta kariba, dukha, dukha kariba, dukhi heba, kandiba, mana bhala nahi, mana kharap)

Shame: ashamed, bashful, embarrassed, shame, shameful, shy (laja kariba, laja madiba, lajjita heba, lajya, muha luhaiba)

Wonder: amazed, astonished, astonishment, awe, wonder, wow (adbhuta, ascharjya, ascharjya heba, chakita, chamaki jiba)

In the case of neutral portrayals, words that described instrumental actions, like sitting, moving, jumping, or dancing, and cognitive-perceptual activities, like thinking, seeing, or waving hands, were categorized as neutral.